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Transabdominal cerclage for closure of the incompetent cervix

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Summary

In addition to the limited published experience with transabdominal cervical cerclage (TCC) we report the use of this procedure in 14 women with a diagnosis of cervical incompetence, and a cervical deformity or defect precluding the usual transvaginal approach. In 13 pregnant patients and in one nonpregnant woman a band was placed transabdominally around the cervix at the level of the isthmus. No significant perioperative complications occurred. Two women had two consecutive pregnancies following TCC, so we report the outcome of 16 pregnancies. Fetal salvage increased from 16% before to 94% after TCC. Our experience and an analysis of the available literature support the view that TCC may be a beneficial procedure in women with cervical incompetence due to a severely traumatized cervix.

Cervical incompetence; Cervical cerclage; Transabdominal cerclage; Cervical deformity

Introduction

The usual treatment of women with a diagnosis of cervical incompetence consists of cervical cerclage, performed transvaginally in the course of the first or early in the second trimester of pregnancy, with the objective of encircling and closing the cervix at the level of the isthmus. Although adequate in most cases, the transvaginal Shirodkar [1] or McDonald [2] procedures may be difficult and hazardous in pregnant women with an absent, very short, or severely lacerated cervix. In these

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patients a transabdominal approach, as first described more than 20 years ago by Benson and Durfee [3], may be an attractive and beneficial alternative.

Published experience with transabdominal cervical, or cervicoisthmic, cerclage in pregnant women with a diagnosis of cervical incompetence accompanied by a cervical deformity or defect is limited to four reports that cover a total of 38 patients with 48 pregnancies following treatment [3–6]. One report [7] presents the results of the operation carried out in 17 pregnant patients with recurrent pregnancy losses but without an abnormal cervix. Transabdominal cerclage has also been performed before conception in a small number of cases [5,7–9].

In an attempt to contribute to the assessment of the risks and benefits of the procedure we report our experience with transabdominal cervical cerclage (TCC) in 14 patients, and we discuss the pertinent literature.

Patients and methods

Patients

Patients were selected for TCC on the basis of a characteristic history of cervical incompetence, and the presence of an extremely short, scarred, or partially absent cervix. A characteristic history was defined as one including at least two successive second-trimester pregnancy losses, characterized by premature rupture of the membranes without preceding painful uterine contractions and followed by delivery of a usually live fetus after a short and relatively painless labor [10].

In a 4-year period beginning January 1983, 10 nonpregnant women who met these criteria were selected for elective TCC in their next pregnancy. In addition, four women were referred to our institution during pregnancy for emergency TCC. These patients also had a characteristic history of cervical incompetence, and in the present pregnancy a Shirodkar cerclage had already been performed elsewhere late in the first trimester. Due to a short and scarred cervix transvaginal placement of the cerclage was difficult and was followed by slippage or tearing out of the ribbon, and cervical dilatation.

The age of the 14 women at the time of TCC was 24–38 (median 26.5) years. They had 50 pregnancies between them, the outcome of which is summarized in Table 1. Their histories did not reveal diagnostic curettages, induced abortions, conization or amputation of the cervix. Nine women had undergone one or more transvaginal cerclages in previous pregnancies. One patient had been exposed in utero to diethylstilbestrol. Before pregnancy hysterosalpingography and a Hegar test were done in all women, but the results were not used in the selection for TCC. The hystrogram showed a normal uterine cavity in all women except in one patient who, several years previously, had undergone a metroplasty because of a septate uterus. Other causes of second-trimester abortion such as maternal endocrine, systemic or autoimmune disorders, isoimmunization, syphilis and chronic cervical infections had been ruled out. All patients had severe cervical deformities, including very short cervixes with an absent anterior ($n = 3$) or posterior ($n = 7$) lip, and deep unilateral ($n = 8$) or bilateral ($n = 2$) forniceal lacerations.

TABLE I

Obstetric outcome in 14 patients before and after transabdominal cervical cerclage (TCC)

	Before TCC	After TCC
Total number of pregnancies	50	16
1st-trimester loss	4	0
2nd-trimester loss	37	1
premature deliveries	4	6
neonatal survival	3	7 ^b
term deliveries	5	9
neonatal survival	5	9
Total number of surviving infants	8	16
Fetal salvage rate ^a (%)	16	94

^a Fetal survival related to total number of pregnancies, 1st-trimester loss excluded.^b All between 35 and 37 weeks, one twin.*Surgical procedure*

The principles of the operation and the necessity for the eventual termination of pregnancy by cesarean section were explained to all patients. One woman preferred to have the operation done before conception. In the women selected for elective TCC the procedure was performed between 12 and 16 (median 15) weeks' gestation; the four women who underwent emergency TCC were operated upon at a duration of pregnancy of 17, 17, 20 and 21 weeks, respectively. None of the patients had evidence of abnormal uterine contractility, ruptured membranes or uterine bleeding. An ultrasonogram was obtained on the day before operation to ascertain the presence of fetal cardiac activity and the absence of detectable fetal anomalies. All operations were performed by the authors according to the method reported by Benson and Durfee [3], with some modification, and the technique will be described briefly.

After induction of general anesthesia the peritoneal cavity is entered by a generous Pfannenstiel incision, which usually provides satisfactory exposure. A low midline incision was used in three cases, a 16 week twin pregnancy, and a 20 and a 21 week gestation. The uterovesical peritoneal reflection is divided transversely and the bladder is carefully advanced downward to expose the uterine isthmus and the bilateral uterine vasculature. A vessel-free area in the paracervical tissue is identified between the pulsating ascending and descending branches of the uterine arteries and the isthmus, just below the uterine 'waist' (Fig. 1). This is done most easily by palpation of the paracervical tissue between a finger of one hand placed on the anterior side of the uterus and a finger of the other hand placed behind the uterus. After the vessel-free space has been localized, the finger of the posterior hand is kept in place just above the insertion of a uterosacral ligament, gently pushing the uterine vasculature laterally and away from the cervix. Guided by this finger the vessel-free space is then carefully punctured from the anterior side with the tip of a long right-angle clamp with tapered jaws. After the tip of the clamp has perforated the posterior leaf of the broad ligament, the jaws are opened and one end of a 20 cm

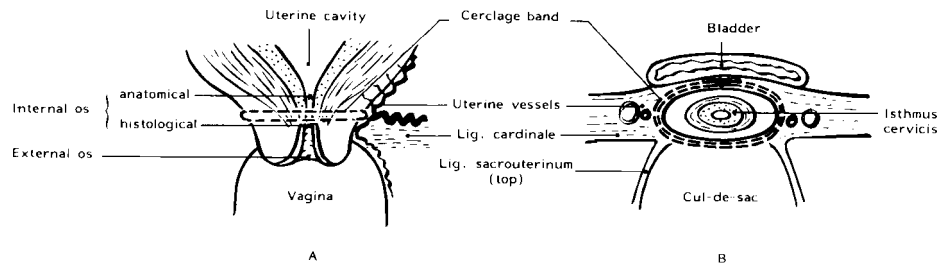


Fig. 1. Schematic representation of the location of a cerclage band placed transabdominally around the cervical isthmus in a frontal (A) and a transversal (B) plane. Note the vessel-free area between the ascending and descending branches of the uterine artery and the cervix. Posteriorly the band lies over the uterine peritoneum, anteriorly the knot is covered by the bladder.

long and 0.5 cm wide Mersilene (Ethicon GmbH, Norderstedt, F.R.G.) ribbon is grasped and carefully pulled through the paracervical tissue from posterior to anterior. This procedure is repeated on the contralateral side, where the other end of the band is pulled through the paracervical space from posterior to anterior. The band thus lies flat over the posterior peritoneum of the uterus, just above the insertion of the uterosacral ligaments, and encircles the isthmus at a level between the former anatomical and the histological internal os (Fig. 1). The band is pulled tightly around the cervix, and the pulsating uterine arteries are palpated to ascertain the correct position of the ribbon medial to the uterine vasculature. It is then tied snugly on the anterior side of the cervix with a square knot and the cut ends with a length of about 0.5 cm are fixed to the band with fine nonabsorbable sutures. The bladder is replaced covering the band on the anterior side, and the peritoneal reflection is closed. Posteriorly the band remains uncovered by the peritoneum. The abdomen is closed in the usual fashion. During the whole procedure the uterus is kept warm and wet and remains inside the abdominal cavity. During the operation and the first two postoperative days all pregnant patients received fenoterol by continuous intravenous infusion ($1 \mu\text{g}/\text{min}$) as a uterine relaxant. The procedure performed in the nonpregnant woman was not different from that in the pregnant patients; she became pregnant three months after the operation.

After the operation all patients received standard antenatal care without frequent vaginal examinations, and reduction of physical and sexual activity was not recommended.

Results

Perioperative complications

In the patient who had a previous metroplasty exposure of the uterus and of the isthmic area caused considerable difficulty due to dense adhesions. In a few cases passage of the band through the paracervical tissue caused some venous bleeding, but it was never severe and could be easily controlled. The average estimated blood loss was 200 ml; blood transfusion was never necessary. Following routine postoper-

ative care all patients were discharged within 10 days. No complications such as fever, hemorrhage, rupture of membranes or painful uterine contractions occurred within the first four weeks after the operation. Three women complained of frequent and painful micturition which could not be attributed to bacterial cystitis. The bladder irritability, perhaps due to the bulk of the anteriorly tied knot, gradually subsided within a few weeks.

Pregnancy outcome

Two women were delivered twice following TCC, so we report the course and outcome of 16 pregnancies. One patient, the woman who had previously undergone a metroplasty, was admitted at 17½ weeks' gestation with regular and painful uterine contractions, 4½ weeks after TCC. The cervix was closed and she responded promptly to bedrest and fenoterol intravenously. However, repeat ultrasonograms revealed insufficient fetal growth, and fetal death occurred at 21½ weeks' gestation. The cervix was effaced and 2 cm dilated, and delivery could be accomplished with the cerclage in situ.

The course of the other 15 pregnancies was uneventful; pregnancy outcome is summarized in Table I. Fifteen pregnancies resulted in delivery of 16 live and healthy infants between 35 and 39 weeks' gestation; four pregnancies were terminated in the 35th week and two in the 36th week because of suspected premature labor. The lower-segment cesarean sections were uncomplicated, no intra-abdominal adhesions were found to be present, and the cerclage band was not removed.

All infants had birthweights above the 10th centile of the Dutch weight curve corrected for parity and fetal sex [11]. One infant, born at 35 weeks' gestation, had a brief period of respiratory distress. No neonatal problems were encountered in the other infants, and all infants are thriving.

Discussion

There is no objective and reproducible diagnostic method to confirm or reject the diagnosis of cervical incompetence suggested by the obstetric history [12]. The diagnosis still relies on a carefully taken and characteristic history, as outlined more than two decades ago by McDonald [10], and it remains a diagnosis by exclusion. For that reason we selected our patients for TCC on the basis of the obstetric history only, without taking into account the results of diagnostic tests performed in the nonpregnant state.

Cervical cerclage has become an accepted procedure for treatment of women with a diagnosis of cervical incompetence, although proof of its efficacy has not yet been documented in a properly controlled, prospective trial [13]. The transvaginally performed Shirodkar or McDonald cerclage carries a significant risk of complications [14], and the complication rate of the transabdominal approach may be even higher because of the laparotomy and the ensuing cesarean section. Therefore only patients with a history of at least two consecutive midtrimester pregnancy losses and with a severely traumatized cervix were selected for TCC. Most patients were referred to us from elsewhere, and a reliable estimate of the proportion of women

with a diagnosis of cervical incompetence that would meet our criteria for TCC cannot be made.

According to our protocol women with evidence of other pathological conditions that could be held responsible for the recurrent pregnancy losses were to be excluded. In this respect the history of the woman who previously underwent a metroplasty because of a septate uterus is a case in point. In addition to three consecutive midtrimester pregnancy losses with a history compatible with a diagnosis of cervical incompetence, this patient presumably had also been delivered abroad of at least one growth-retarded infant. The obstetric history could not be assessed in more detail because no previous medical records were available. This patient may not have been a suitable candidate for TCC.

Cervical trauma due to dilatation of the cervix for diagnostic or therapeutic curettage, traumatic deliveries, and cervical surgery are often considered predisposing causes of cervical incompetence [10,12]. These factors were not encountered in our patients' histories, but nine patients had had one or more Shirodkar cerclages in previous pregnancies. Grasping and manipulating the pregnant cervix may cause significant trauma [12], and dilatation of the fibrotic cervical tissue during labor after removal of the band has been shown to result quite often in extensive lacerations [12,13]. Although in our patients the cervical status at the time of the first Shirodkar cerclage was usually not well-documented, the trauma that caused the severe cervical deformity could be attributed to placement of a Shirodkar band and vaginal delivery following a failed cerclage in at least four women.

As an elective procedure TCC may best be done between approximately 12 and 16 weeks' gestation. At that duration of pregnancy ultrasonography can reliably detect major fetal anomalies, and the risk of spontaneous abortion in the presence of a formed fetus with cardiac activity is small [15]. There is no indication to perform the operation earlier in pregnancy, since abortions before 12 weeks' gestation are usually unrelated to cervical incompetence. In our opinion it is also not advisable to perform the operation on an elective basis later in the second trimester, because it will be more difficult to obtain adequate exposure, and more manipulation of the uterus will be required with a potential risk of uterine contractions. However, as an emergency procedure TCC has been performed successfully up to 26 weeks' gestation [3,5].

In modern obstetrics virtually all transvaginal cerclage procedures are done in pregnancy [13], and it is not clear why some authors recommend that transabdominal cerclage should be done in the non-pregnant state [8,9]. Preconceptional cerclage has the important disadvantage that pregnancy may not occur. In that case the operation has been done unnecessarily, and the patient may attribute her infertility to the surgical procedure and may request that the cerclage be removed.

In our small series significant perioperative complications did not occur, and maternal morbidity was minor. Hemorrhage is the main perioperative complication in reported series in which the uterine vasculature is dissected to localize the vessel-free paracervical space [3,5,6]. In our experience dissection is not necessary; the vessel-free area can easily be determined by palpation, and during puncture of the paracervical tissue the uterine vessels are avoided by gently pushing them laterally. After pulling the ribbon through, the uterine arteries should be palpated to

make sure that they are not caught inside the ligature, which will cause uterine ischemia, most likely leading to fetal death [5]. One author [4] ties the ribbon posteriorly, which would seem to offer no demonstrable advantage over tying it anteriorly, whereas it requires extensive manipulation and usually eventration of the uterus.

The band, placed between the former anatomical and the histological internal cervical os [3], apparently does not compromise the development or action of the lower uterine segment. It does, however, make evacuation of the uterus in the case of abortion difficult and precludes vaginal delivery. Posterior colpotomy and division of the posterior part of the ribbon has been recommended [3], but this is a technically difficult and hazardous procedure, in particular in the third trimester. This means that hysterotomy may be required in the case of fetal demise, and cesarean section must be performed in all pregnancies in which fetal viability is reached. At cesarean section the cerclage is left in place because attempts at removing it may result in substantial bleeding and also because it may serve its purpose in later pregnancies [3].

Because of the difficulty in taking into account the many variables that may affect pregnancy outcome, assessment of the efficacy of a cervical cerclage procedure is usually limited to using patients as their own controls. However, improvement in pregnancy outcome following a cerclage procedure may not necessarily be due to that procedure; spontaneous resolution of recurrent pregnancy loss is known to occur, and this may also include losses attributed to cervical incompetence [12]. Keeping these considerations in mind, the results with regard to fetal salvage obtained in our series of patients are quite satisfactory. The fetal salvage rate, defined as the number of surviving infants expressed as a percentage of the total number of pregnancies excluding early abortions [16], increased from 16% before to 94% after TCC. The cause of the only case of fetal death in our series, which occurred more than two months after TCC and was preceded by fetal growth retardation, remains unknown. Although the possibility of constriction of a main branch of one of the uterine arteries by the ligature cannot be excluded, placental insufficiency may have been a primary event in this patient.

Table II presents a review of the published fetal salvage rates before and after TCC in 81 patients. The improvement in fetal salvage after TCC is impressive, in particular in view of the severity of the problem in these patients. Not taking into account the patients reported by Olsen and Tobiassen [7], who did not have a cervical deformity, there remain 52 women with a severely traumatized cervix, 26 of whom had a failed transvaginal cerclage in one or more previous pregnancies. In these women the fetal salvage rate increased from 17% before to 89% after TCC.

Transabdominal cervical cerclage would seem to have several advantages over a transvaginal procedure in women with a markedly shortened, severely lacerated or partially or completely absent cervix. First, extensive cervical manipulation and hazardous dissection necessary to encircle the cervix at a sufficiently high level are avoided. Second, the band cannot slip because it is kept in place by the enlarging uterus above and the uterosacral and cardinal ligaments below. Third, the cerclage is not removed at delivery and may serve in future pregnancies, which most patients desire after the encouragement of a first successful pregnancy following TCC. On

TABLE II

Fetal salvage before and after transabdominal cervical cerclage (TCC) as reported in the literature and in the present series

Authors	Patients (n)	Before TCC				After TCC			
		Pregnancies		Living infants (n)	Fetal salvage rate (%)	Pregnancies		Living infants (n)	Fetal salvage rate (%)
		Total (n)	1st trim. ab. excluded (n)			Total (n)	1st trim. ab. excluded (n)		
Benson and Durfee [3]	10	47	47 ^a	5	11 ^a	13	13	9	69
Watkins [6]	2	9	9	5	56	2	2	2	100
Mahran [4]	10	67	67 ^a	7	10 ^a	10	9	7	78
Novy [5]	16	65	55	13	24	23	22	21	95
Olsen and Tobiassen [7]	29	101	67	12	18	35	33	32	97
Present series	14	50	46	8	16	16	16	16 ^b	94
Total	81	339	291	50	17	99	95	87	91

^a) Number of first-trimester abortions not known.^b) One twin.

the other hand, the procedure also has real and potential drawbacks. First, TCC requires a laparotomy, with longer recovery and hospitalization than a transvaginal cerclage. Second, the operation may carry a higher risk of maternal morbidity, in particular due to hemorrhage. Third, the band precludes vaginal delivery.

We conclude that the advantages of TCC may outweigh its disadvantages in the carefully selected, relatively rare patient with a diagnosis of cervical incompetence whose abnormal cervix makes a transvaginal approach technically hazardous or unfeasible, in particular when this has already led to a failed transvaginal cerclage.

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